

### **REMARKS**

Claims 1-4, 9, 12-14, 16-19, 21-23, 25-30, 32, 33, and 35-44 are pending in the instant Application. Claim 38 is withdrawn from prosecution.

Applicants respectfully request that the Examiner notes the new attorney docket number (19662-029001) for the subject application, and asks that the Office records be updated in respect of the same.

### **Amendments to the claims**

Applicants amend claims 1, 12, 29, and 30 to attend to various informalities.

Applicants have amended claims 1, 16, 39, 40, and 43 herein to delete references to the terms “thermopneumatic”, and “thermopneumatically” wherever they occur. Thus, for example, claim 1 now recites a microfluidic device that comprises an actuator. Support for such amendments can be found in the specification as filed at, for example [0067] and therefore such amendments do not introduce new matter into the claims.

Accordingly, and in light of such amendments to the claims, the amendments to the drawings requested by the Examiner are no longer necessary.

Applicants also amend claim 28 to recite ‘downstream surface of the microdroplet’, language that was present in originally filed claim 28.

Finally, Applicants amend claim 40 to insert the phrase “in response to a change in a pressure of a gas”, which is supported by the claims as originally filed.

Entry of the instant amendments to the claims is therefore respectfully requested.

### **REJECTIONS OF THE CLAIMS**

#### **Rejections under 35 U.S.C. § 112 (¶ 1)**

The Examiner has rejected claims 1-4, 9, 12-14, 16-19, 21-23, 25, 26, 39, and 40-44 under 35 U.S.C. § 112 (first paragraph) as allegedly lacking written description support for the terms “thermopneumatic”, and “thermopneumatically”. Applicants respectfully traverse the rejection.

Applicants have amended the various claims to delete references to the terms “thermopneumatic”, and “thermopneumatically”, thereby rendering the rejection of record moot.

Accordingly, Applicants respectfully request that the rejection under 35 U.S.C. § 112 (first paragraph) be withdrawn.

**Rejections under 35 U.S.C. § 112 (¶ 2)**

The Examiner has rejected claim 28 under 35 U.S.C. § 112 (second paragraph) as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the Examiner has requested clarification of the item too which the term ‘downstream surface’ refers in claim 28. With the amendments herein, Applicants have amended claim 28 to recite a “downstream surface of thee microdroplet.”

Accordingly, Applicants respectfully request that the rejection of record be withdrawn.

**Rejections under 35 U.S.C. § 103(a)**

The Examiner has rejected claims 1-4, 9, 12-14, 16-19, 21-23, 25-30, 32, 33, 35-37, and 39, under 35 U.S.C. § 103(a) as allegedly being obvious over U.S. Patent Application Publication No. 2002/0055167 to Pourahmadi, (“Pourahmadi”, hereinafter), in view of U.S. Patent No. 6,130,098 to Handique (“Handique” hereinafter).

The U.S. Patent and Trademark Office (“PTO”) bears the burden of establishing a *prima facie* case of obviousness. *In re Bell*, 26 USPQ2d 1529 (Fed. Cir. 1993). To establish a *prima facie* case, the PTO must satisfy three basic criteria. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify or combine the reference teachings in the manner suggested by the PTO. *In re Rouffet*, 149 F.3d 1350, 47 USPQ2d 1453 (Fed. Cir. 1998). Second, the skilled artisan, in light of the teachings of the prior art, must have a reasonable expectation that the modification or combination suggested by the PTO would be successful. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Finally, the prior art reference, or references when combined, must teach or suggest each and every limitation of the claimed invention. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). The teaching or suggestion to make the claimed invention and the reasonable expectation of success must both be found in the prior art, not in the Applicants’ disclosure. *In re Vaeck*, 20 USPQ2d 1438 (Fed. Cir. 1991). If any one of these criteria is not met, *prima facie* obviousness is not established.

Applicants respectfully submit that the Examiner has not satisfied the Office's burden of establishing a *prima facie* case, at least because no motivation to combine the references has been found, and also because Applicants respectfully disagree with the Examiner's assertion that one of ordinary skill in the art would have had a reasonable expectation of success in combining the teachings of Pouramahdi and Handique.

In essence, the Examiner asserts that Pouramahdi discloses each element of the rejected claims, except for an actuator. Since Handique discloses an actuator for facilitating fluid transport in a microfluidic device, the Examiner alleges that one of ordinary skill in the art would have had a reasonable expectation that the respective teachings could be successfully combined.

Applicants respectfully disagree. First, Pouramahdi discloses a device for "processing relatively large fluid samples (*e.g.*, 0.1 to 10 mL)" (Pouramahdi, at [0045]). As the Examiner can appreciate, such sample sizes are equivalent to 100  $\mu\text{L}$  – 10,000  $\mu\text{L}$ . (See also, Pouramahdi at [0163] "the volume of fluid sample forced to flow through the device is in the range of 1 to 100 mL"). In Pouramahdi, the preferred source of fluid motive source is an electrolytic pump. (see, *e.g.*, Pouramahdi at [0065]). Although Pouramahdi does reference "[o]ther potential fluid motive sources include[ing] a pneumatic pressure source" (at [0067]), it is silent as to the implementation or efficacy of such sources. Indeed this description can at best be regarded as prospective, rather than a description of an actual embodiment.

By contrast, Handique teaches a method of moving microdroplets having a volume in the range "between approximately 0.01 and 100 nanoliters" (Handique at col. 7, lines 60-62). (1 nanoliter =  $10^{-3}$   $\mu\text{L}$ , so the volumes contemplated by Handique are in the range  $10^{-5}$  –  $10^{-1}$   $\mu\text{L}$ .) The largest such volumes are therefore around 1,000 times less than the *smallest* liquid volumes deployed by Pouramahdi.

Neither Handique nor Pouramahdi provide a teaching that a gas actuator disclosed by Handique would be effective to move the large sample volumes deployed by Pouramahdi. In fact, it can be shown that the volume of gas in an actuator exceeds the volume of liquid that it is required to move by at least a factor of 5. See, *e.g.*, Handique, *et al.*, "On-Chip Thermopneumatic Pressure for Discrete Drop Pumping", *Anal. Chem.*, 73:1831-1838, (2001), (a copy of which is attached hereto as an Appendix), specifically at page 1835, right hand column.

Thus, it can be seen that, in order to move the volumes of liquid processed by Pouramahdi by using a gas actuator, an impractically large pump volume compared to the overall device size would be required. This is because not only are the volumes of fluid deployed by Pouramahdi many orders of magnitude larger than those of Handique, but the gas volume required must itself still be many times greater in size again. In short, the Examiner has not established that the gas actuator of Handique could practically be deployed in Pouramahdi's device due to the large volumes of gas that would need to be stored.

For at least this reason, one of ordinary skill in the art would not have had a reasonable expectation of success that the actuator of Handique could be employed in the apparatus of Pouramahdi.

The Examiner has additionally rejected method claims 27 – 30, 32, 33, 35 –37, and 40 – 44 over Pouramahdi in view of Handique. Applicants traverse this rejection on the same ground, that one of ordinary skill in the art would not have reasonably expected a combination of the apparatuses of Pouramahdi and Handique to successfully carry out the claimed methods. However, Applicants also respectfully point out that the Examiner's reliance on inherency as a theory to support the rejection, is misplaced. Since a single reference disclosing a device recited in the claims has not been identified in the art, it cannot be established that there is an inherent operation of such a device, sufficient to anticipate the claims.

Finally, the Examiner has not articulated a motivation for one of ordinary skill in the art to combine the teachings of Pouramahdi and Handique. Applicants additionally submit that one of ordinary skill in the art would have concluded, upon appreciating the teachings of both Pouramahdi and Handique, that a combination of the two would have been impractical and therefore undesirable, based upon the gas volumes that would be needed and thus would not have been motivated to combine them.

Dependent claims are nonobvious under 35 U.S.C. § 103 "if the independent claims from which they depend are nonobvious." In re Fine 837 F.2d 1071; 5 USPQ.2d 1596; MPEP 2143.03.

Accordingly, Applicants respectfully submit that all of the rejected claims are non-obvious in view of Pouramahdi and Handique, and ask that the rejection of record be removed.

**CONCLUSION**

In view of the above remarks, Applicants respectfully submit that the subject application is in good and proper order to proceed to issue. If, in the opinion of the Examiner, a telephone conference would resolve any outstanding matters not heretofore resolved, the Examiner is encouraged to call the undersigned at (650) 839-5070.

No fee is believed owed in connection with filing of this amendment. Nevertheless, should the Commissioner determine otherwise, he is authorized to charge any underpayment or credit that no fees are owing with this submission, however, should the Office determine otherwise, the Commissioner is hereby authorized to charge Applicants' Deposit Account No. 06-1050 (reference 19662-029001) for any charges or credits.

Respectfully submitted,

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